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Decoherence from Spin Environments FERNANDO CUCCHIETTI, Los Alamos National Laboratory, JUAN PABLO PAZ, Universidad de Buenos Aires, WOJCIECH ZUREK, Los Alamos National Laboratory — We examine two exactly solvable models of decoherence – a central spin-system, (i) with and (ii) without a self–Hamiltonian, interacting with a collection of environment spins. In the absence of a self–Hamiltonian we show that in this model (introduced some time ago to illustrate environment–induced superselection) generic assumptions about the coupling strengths can lead to a universal (Gaussian) suppression of coherence between pointer states. On the other hand, we show that when the dynamics of the central spin is dominant a different regime emerges, which is characterized by a non–Gaussian decay and a dramatically different set of pointer states. We explore the regimes of validity of the Gaussian–decay and discuss its relation to the spectral features of the environment and to the Loschmidt echo (or fidelity).

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